Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Small angle X-ray scattering. Edited by O. GLATTER and O. KRATKY. Pp. x + 515. London: Academic Press, 1982. Price £43·60, US $89.50.

This book aims to give a compact presentation of the basic theory, techniques and applications of small-angle X-ray scattering (SAXS) at the present time. In fact, there has been a real gap in the literature on this subject, since the few books available on small angle X-ray scattering were published several years ago, and recent reviews have focused only on special aspects, or certain applications.

Today the importance of this kind of investigation in many areas, such as biology, macromolecular science, metallurgy and materials science, is well established. Small-angle X-ray scattering is now a standard technique for structural and morphological studies on non-periodic (and also periodic) matter aggregations, such as macromolecules in solution (or in the solid state) and complex multiphase particulate inorganic systems, either isotropically dispersed, or spatially oriented. The dimensions of the objects which can be investigated range approximately from 10 to some thousands of ångströms.

This book is aimed towards graduate students and researchers, especially oriented towards biology and macromolecular science; in this area it has certainly filled the existing gap in the literature. The general theme of the book concerns the analysis of SAXS from dilute, unoriented systems. It is divided into three main parts: (i) theory, (ii) experimental methods, and (iii) applications.

In regard to the first part (general theory, data treatment and interpretation), the need for a clear and complete presentation has genuinely been felt by newcomers, as well as by experimental researchers in the field. In these chapters the following significant topics are treated: correlation function and chord distribution; the influence of dense packing, inter-particle interference and the concentration effect; mathematical description of the experimental effects; smoothing, desmearing and Fourier transformation of data [the indirect transformation method developed by O. Glatter has been shown to be very efficient for computing the distance distribution function, $p(r)$, and all derived parameters such as the radius of gyration R_g, forward scattering, $I(0)$, and so on]; calculation of scattered intensities and distance distributions in models, with many examples of particles of various shapes having either a homogeneous or an inhomogeneous electron density; coil molecules; models with specific experimental applications; synthetic polymers in solution; intensity calculations based on the ideal lamellar model for organic polymers in the solid state. Those theoretical topics which are of the most general interest are written by O. Glatter, G. Porod, C. G. Vonk and R. G. Kirste & R. C. Oberthür (these last three authors on aspects of scattering from organic polymers).

In the part on experimental technique and practice, as well as the data collection methods (O. Kratky, K. C. Holmes, H. Leopold and K. Müller), the geometries and characteristics of all cameras having a slit or block collimation (including the more advanced ones, like the Bonse–Hart, the cone and the integrated cameras) are compared. Point-collimation cameras and special optical arrangements are treated in the context of the most advanced experimental facilities, like synchrotron radiation and purpose-built focusing monochromators. These subjects are extensively discussed and clearly treated from a pedagogic standpoint.

Concerning the part on applications, the book reports the majority of the most important scientific results obtained by SAXS in recent years on the structural and morphological properties of proteins, nucleic acids, membranes, natural and synthetic polymers, aggregations and micellar structures of small molecules in solution (R. G. Kirste, O. Kratky, P. Laggner, K. Muller, R. C. Oberthür, I. Pilz, C. G. Vonk and P. Zipper). Some of these chapters can be considered as complete reviews of the current literature. The SAXS data evaluation on proteins shows their shape, the molecular parameters and the structure (secondary, tertiary and quaternary) as well as their conformational changes. The chapter entitled *Lipoproteins and membranes* reports SAXS studies in the field of lipids and lipid–protein complexes of biological origin. The contrast-variation method by solvent exchange is discussed here. This topic is treated more generally by H. Stuhrmann in the chapter entitled *Contrast variation*. Some aspects of small-angle neutron scattering are also discussed in connection with this topic. The contrast variation in neutron scattering is achieved in a most elegant way by isotopic replacement of the solvent; in particular, H_2O/D_2O mixtures cover a wide range of scattering densities.

The chapter by G. Kostorz, which is devoted to inorganic substances, includes some very interesting studies on the determination of concentration limits in the metastable miscibility gap of binary or ternary alloys, as well as some decomposition processes in alloys and in glasses, and the defects in irradiated metals. However, this chapter seems to be over-much compressed if we consider the considerable industrial interest in catalysts, alloys, glasses and microporous materials such as the carbons.

In conclusion, the various contributions have been well coordinated by the Editors. The clear presentation of so many topics, by respected and well-known specialists, certainly compensates for the drawback of a certain heterogeneity that results when so many topics are developed by different authors

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